

JP 02-309,937

Code: 5000-76260

JAPANESE PATENT OFFICE  
PATENT JOURNAL (A)  
KOKAI PATENT APPLICATION NO. HEI 2[1990]-309937

Int. Cl. <sup>5</sup> :	A 61 F 13/15
Sequence Nos. for Office Use:	A 41 B 13/02 6606-3B
Filing No.:	Hei 1[1989]-130783
Filing Date:	May 24, 1989
Publication Date:	December 25, 1990
No. of Claims:	4 (Total of 3 pages)
Examination Request:	Not filed

PAPER DIAPER

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Claims

1. A paper diaper, characterized by the fact that a deodorant is contained in the paper diaper, constituted by surrounding a pulp fiber layer having a contained or dispersed highly water-absorbable polymer with a surface material consisting of a nonwoven fabric and a back side material consisting of a plastic film.

2. The paper diaper described in Claim 1, characterized by the fact that a deodorant is coated on or impregnated in the nonwoven fabric used as the surface material.

3. The diaper described in Claim 1, characterized by the fact that a deodorant is coated on or impregnated in the pulp fiber layer.

4. The paper diaper described in Claim 1, characterized by the fact that any of the nonwoven fabric, paper sheet, or cloth sheet coated or impregnated with a deodorant is laminated inside the diaper.

#### Detailed explanation of the invention

##### Industrial application field

The present invention relates to a paper diaper for the prevention of emission of the smell of excrement, in particular.

##### Prior art

In recent years, paper diapers for both infants and adults have exhibited a rapid growth because of their remarkable absorption performance and convenience in handling. It is seen that the expansion of their popularity and their demand will further increase from now on.

Conventionally, for paper diapers, three properties including no leakage, skin care, and ease of use are required. Recently, any of the paper diapers available on the market are all sufficient in these properties. However, it cannot be said that any of these is sufficient yet in regard to the malodor-preventing function for excrement. This is the current situation.

The smell of excrement of infants, in particular, is generally not very strong. However, the smell of excrement of adults is generally strong. Therefore, the current situation is that odor prevention is a new required property.

##### Problems to be solved by the invention

The present invention has an objective to provide a paper diaper that is sufficient in three properties including no leakage, skin care, and ease of use, and excellent in odor prevention with respect to the smell of excrement, in particular.

##### Means to solve the problems

As a result of zealous investigations on the problems described previously, the present inventor has completed the invention by the following constitution. In other words, the present invention is characterized by the fact that a deodorant is contained in a paper diaper constituted by surrounding a pulp fiber layer having a contained or dispersed highly water-absorbable

polymer with a surface material consisting of a nonwoven fabric and a back side material consisting of a plastic film.

### Function

In the constitution mentioned previously, the maximum characteristic of the highly water-absorbable polymer is its astonishing water absorption amount. As its specific materials, starch derivatives, polyoxyethylene type, carboxymethylcellulose type, maleic acid type, vinyl acetate type, polyacrylate type and so on are available.

The pulp constituting the pulp fiber layer is used in a state of cotton-shaped pulp or tissue paper. The pulp fiber layer with the absorption amount and the retaining power inferior to those of the highly water-absorbable polymer diffuses, as soon as possible, the excreted urine by the utilization of its capillary phenomenon. It has the characteristic of retaining the urine in the hydrophilic voids. By having a state of containing or diffusing a highly water-absorbable polymer in this, urine can be absorbed at an extremely good efficiency.

The present invention is characterized by the fact that a deodorant is contained in the paper diaper. The state of the deodorant contained [in the diaper] may be any of

- ① A state in which the deodorant is coated on or impregnated in the nonwoven fabric used as a surface material,
- ② A state in which the deodorant is coated on or impregnated in the pulp fiber layer,
- ③ A state in which the nonwoven fabric coated or impregnated with a deodorant is laminated inside the diaper,
- ④ A state in which the paper sheet coated or impregnated with a deodorant is laminated inside the diaper,
- ⑤ A state in which the cloth sheet coated or impregnated with a deodorant is laminated inside the diaper, etc.

From a practical aspect, it is most preferable to adopt the state of ③ or ⑤ in those mentioned previously. The reason is that the nonwoven fabric and cloth generally have a softness similar to paper and they are excellent in the deodorant coating or impregnating suitability due to the excellent water resistance and water-resistant strength. Furthermore, since the characteristics of a large specific surface area can be utilized, the malodor adsorption efficiency is good in the case of processing of a deodorant on these. Thus, the deodorizing performance can be improved.

In the case of ①, it is important to select a deodorant that does not cause harm to the skin for use since the surface material is the portion in direct contact with the skin. In this sense, there are restrictions in the types of the deodorants that can be used. In the case of ②, there are difficulties in the processing characteristics of coating or impregnation. In addition, owing to drying after coating or impregnation, there are problems in which the original feeling possessed

by the material is decreased, softness is lacking, and water absorptivity is decreased. In the case of ④, water-resistant strength and water absorptivity are poor in comparison to the case of ③ or ⑤.

Next, in the case of the adoption of ③, ④ or ⑤, it is desirable that the lamination position of these sheets in the paper diapers be located between the pulp fiber layer and the back side material (the plastic film) (with the inclusion of the nonwoven fabric as the surface material and the pulp fiber layer from the portion in contact with the skin). The reasons are that the deodorant can be located at a position away from the skin (the selection range of deodorants that can be used is widened because they do not contact the skin), that the absorption function of excrement by the pulp fiber layer and the highly water-absorbable polymer is not hindered, that the decrease in the performance of the deodorant is small (the function for the absorption of smell will decrease if the excrement directly adheres to the deodorant) since most of the excrement is absorbed by the pulp fiber layer and the highly water-absorbable polymer midway before it reaches the locations where the deodorant is present, that the smell being emitted to the outside by passing through the surface material and the pulp fiber layer is captured midway and can be absorbed efficiently, etc.

Furthermore, in the case of the adoption of ③, ④ or ⑤, it is unnecessary that these sheets have the sizes equivalent to the areas of the paper diapers. In connection with the efficacy, an appropriate dimension can be selected. Next, in regard to the deodorants, the following materials can be mentioned.

#### Chemical reaction type deodorants

Sulfamic acid, oxalic acid, sorbic acid, humic acid, abietic acid, ascorbic acid, and other neutralization reacting substances.

Addition, polymerization and condensation reaction substances of epoxy compounds, maleic acid esters, etc.

#### Physical absorption type deodorants

Activated carbon, zeolite, silica gel, active alumina, active white clay, and ion-exchange resins.

#### Biological deodorants

Those due to the enzymatic actions, *Camellia* extract and other plant extracts.

The deodorants mentioned previously are converted to states of dissolution or dispersion in water. They are contained in the states described in ①-⑤ mentioned previously for use.

The contained amount of said deodorant cannot be specified uniquely since the appropriate amount varies with the type of the deodorant. If efficacy and economy are both considered, a range of 0.5-5 g/m<sup>2</sup>, preferably 0.7-2 g/m<sup>2</sup> as the dry weight is appropriate.

The application examples of the present invention will be described in the following. However, of course, the range of the present invention is not to be restricted to these application examples.

#### Application Example 1

For a paper diaper constituted by surrounding a pulp fiber layer obtained by containing or dispersing a highly water-absorbable polymer with a surface material consisting of nonwoven fabric and a back side material consisting of a plastic film, nonwoven fabric obtained by the impregnation of a plant extraction type deodorant (the commercial product name "Biofresh," manufactured by Fresh Co., Ltd.) as a deodorant at a dry weight of 2 g/cm<sup>2</sup> was laminated between said pulp fiber layer and the back side material consisting of a plastic film.

The paper diaper obtained had a far superior deodorizing effect with respect to excrement in comparison to the paper diaper without the implementation of the deodorant treatment when they were supplied in actual use.

#### Application Example 2

For paper diaper constituted by surrounding a pulp fiber layer, obtained by containing or dispersing a highly water-absorbable polymer, with a surface material consisting of nonwoven fabric and a back side material consisting of a plastic film, nonwoven fabric obtained by the impregnation of an aqueous oxalic acid solution as a deodorant at a dry weight of 2 g/cm<sup>2</sup> was laminated between said pulp fiber layer and the back side material consisting of a plastic film.

The paper diaper obtained had a far superior deodorizing effect with respect to excrement in comparison to the paper diaper without the implementation of the deodorant treatment when they were supplied in actual use.

#### Application Example 3

For a paper diaper constituted by surrounding a pulp fiber layer obtained by containing or dispersing a highly water-absorbable polymer with a surface material consisting of nonwoven fabric and a back side material consisting of a plastic film, nonwoven fabric obtained by the impregnation of lauryl methacrylate (a maleic acid ester) as a deodorant at a dry weight of 3 g/cm<sup>2</sup> was laminated between said pulp fiber layer and the back side material consisting of a plastic film.

The paper diaper obtained had a far superior deodorizing effect with respect to excrement in comparison to the paper diaper without the implementation of the deodorant treatment when they were supplied in actual use.

#### Application Example 4

For a paper diaper constituted by surrounding a pulp fiber layer, obtained by containing or dispersing a highly water-absorbable polymer, with a surface material consisting of nonwoven fabric and a back side material consisting of a plastic film, nonwoven fabric obtained by the application of activated carbon as a deodorant at a dry weight of 5 g/cm<sup>2</sup> was laminated between said pulp fiber layer and the back side material consisting of a plastic film.

The paper diaper obtained had a far superior deodorizing effect with respect to excrement in comparison to the paper diaper without the implementation of the deodorizing treatment when they were supplied in actual use.